

along a cross-section of the workpiece in a direction that is opposite to the direction of formation of the metal material during its deposition.

39. A method as set forth in Claim 37 wherein the annealing process comprises subjecting the workpiece to a controlled temperature gradient in which the temperature decreases along a cross-section of the workpiece in a direction that is opposite to the direction of the formation of the deposited metal material.

40. (Amended) A method for reducing voids in a metal material that has been electrolytically deposited into recessed microstructures defined on a surface of a microelectronic workpiece comprising:

electrolytically depositing a metal to substantially fill recessed sub-micron structures on the surface of the workpiece; and then

subjecting the workpiece to an annealing process in which the workpiece is subject to a controlled temperature gradient in which the temperature decreases along a cross-section of the workpiece in a direction that is toward the surface in which the recessed sub-micron structures are formed.

68. (New) A method for reducing voids in a metal material that has been electrolytically deposited into recessed microstructures defined in a surface of a microelectronic workpiece including at least one low-K dielectric layer, comprising:

electrolytically depositing a metal to substantially fill sub-micron recessed structures on the surface of the workpiece; and

subjecting the surface of the workpiece to an elevated temperature annealing process at a temperature that is selected to be below a predetermined temperature at which the low-K dielectric layer would suffer degradation of its mechanical and/or electrical properties.

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69. (New) A method for reducing voids in a metal material that has been electrochemically deposited into recessed microstructures defined in a surface of a microelectronic workpiece comprising:

electrochemically depositing a metal to substantially fill sub-micron recessed structures in the surface of the workpiece; and

then subjecting the surface of the workpiece to an annealing process at a temperature that is at or below about 250 to 300 degrees Celsius.

70. (New) A method for reducing voids in a metal material that has been electrochemically deposited into recessed microstructures defined in a surface of a microelectronic workpiece comprising:

electrochemically depositing a metal to substantially fill sub-micron recessed structures in the surface of the workpiece; and

subjecting the workpiece with deposited metal to an elevated temperature annealing process within a chamber, followed by subjecting the workpiece with deposited metal to a cooling process within the chamber.

71. (New) The method of Claim 36, further comprising depositing a barrier layer on the surface of the workpiece in which the recessed microstructures are formed prior to depositing metal to substantially fill the recessed microstructures.

72. (New) The method of Claim 71, further comprising depositing a seed layer, substantially comprised of the same metal to be deposited to substantially fill the recessed microstructures, onto the surface of the workpiece prior to depositing the metal to substantially fill the recessed microstructures.

73. (New) The method of Claim 36, further comprising depositing a seed layer, substantially comprised of the same metal to be deposited to substantially fill the recessed

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microstructures, onto the surface of the workpiece prior to depositing the metal to substantially fill the recessed microstructures.

74. (New) The method of Claim 69, further comprising depositing a barrier layer on the surface of the workpiece in which the recessed microstructures are formed prior to depositing metal to substantially fill the recessed microstructures.

75. (New) The method of Claim 74, further comprising depositing a seed layer, substantially comprised of the same metal to be deposited to substantially fill the recessed microstructures, onto the surface of the workpiece prior to depositing the metal to substantially fill the recessed microstructures.

76. (New) The method of Claim 69, further comprising depositing a seed layer, substantially comprised of the same metal to be deposited to substantially fill the recessed microstructures, onto the surface of the workpiece prior to depositing the metal to substantially fill the recessed microstructures.

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